Claims

What is claimed is:

1. A magnetic transducer comprising:

a gap layer extending from a write gap toward a back of a yoke, the gap layer being in contact with and conforming to a first planarized surface;

a first pole piece of ferromagnetic material having a second planarized surface;

a second pole piece with a tip positioned at the write gap and in contact with the gap layer;

a third pole piece of ferromagnetic material contacting the second pole piece and extending toward the back of the yoke;

a pedestal of ferromagnetic material extending from the planarized surface of the first pole piece to the write gap, a planarized surface of the pedestal being in contact with the gap layer, a back surface of the pedestal defining a zero throat height line and the back surface being perpendicular to a bottom surface of the second pole piece;

a first back flux closure of ferromagnetic material in contact with the first pole piece and forming part of the back of the yoke;

a second back flux closure of ferromagnetic material forming part of the back of the yoke in contact with the first back flux closure and extending to contact the third pole piece; and

a first coil including a plurality of turns of electrically conducting material which pass between the second pole piece, the third pole piece, the gap layer and the second back flux closure.

2. The magnetic transducer of claim 1 further comprising a second coil including a plurality of turns of electrically conducting material which pass between the first pole piece, the pedestal, the gap layer and the first back flux closure, the second coil being separated from the first pole piece by a layer of dielectric material disposed on the planarized surface of the first pole piece;

3. The magnetic transducer of claim 2, wherein the turns of the first coil have an average spacing distance and the back surface of the pedestal is located within the average spacing distance from the second coil.

4. The magnetic transducer of claim 2, wherein the turns of the first coil are in contact with the gap layer.

5. The magnetic transducer of claim 2, wherein the second coil has a surface that is part of the first planarized surface.

6. The magnetic transducer of claim 1, wherein the second pole piece has a narrowest extent over the pedestal and flares out to a wider extent further away from the pedestal.

7. The magnetic transducer of claim 6, wherein the third pole piece contacts the second pole piece at the wider extent and ends before an air bearing surface of the magnetic transducer.

8. The magnetic transducer of claim 6, wherein the third pole piece contacts the second pole piece at the wider extent and at the tip and extends to an air bearing surface of the magnetic transducer.

9. The magnetic transducer of claim 2, wherein the first planarized surface further includes an upper surface of the second coil, areas of photoresist and areas of alumina.

10. A magnetic transducer having a first pole piece (P1), a second pole piece (P2) and a third pole piece (P3) comprising:

a gap layer disposed on a first planarized surface;

a pedestal pole piece disposed in contact with a first side of the gap layer, the pedestal pole piece confronting the P2 across the gap layer forming a write gap, and the pedestal pole piece contacting the P1 which extends parallel to the gap layer to a back of a yoke;

the P3 being in contact with the P2 and extending to the back of the yoke;

ferromagnetic material forming the back of the yoke in contact with the P1 and the P3;

a first coil including a plurality of turns of electrically conducting material passing between the P1 and the gap layer; and

a second coil including a plurality of turns of electrically conducting material passing between the P3 and the gap layer and confronting the first coil, the first and second coils being separated by the gap layer.

11. The magnetic transducer of claim 10, wherein the first planarized surface further comprises an upper surface of the first coil.

12. The magnetic transducer of claim 11, wherein the first planarized surface further comprises areas of photoresist material and areas of alumina.

13. The magnetic transducer of claim 10, wherein the turns of the second coil are in contact with the gap layer.

14. The magnetic transducer of claim 10, wherein the first and second coils are in contact with the gap layer on opposite sides of the gap layer.

15. The magnetic transducer of claim 10, wherein the pedestal pole piece defines a zero throat height.

16. The magnetic transducer of claim 10, further comprising a third coil disposed between the second coil and the P3.

17. A method of fabricating a magnetic transducer on a wafer comprising the steps of:

depositing ferromagnetic material to form a first pole piece (P1) on the wafer;

a first planarizing step which removes material until a top surface of the first pole piece is planarized;

depositing a layer of dielectric material over the first pole piece;

forming a first coil, the first coil including a plurality of turns of conductive material disposed on the layer of dielectric material;

forming first and second vias through the layer of dielectric material to expose selected areas of the first pole piece, the first via being outside of the first coil and the second via being inside of the first coil;

forming a P1 pedestal of ferromagnetic material in the first via;

forming a lower back flux closure of ferromagnetic material in the second via;

a second planarizing step which removes material from a top surface of the wafer until a selected planarization line is reached where a top surface of the P1 pedestal and a top surface of the lower back flux closure are planarized;

depositing a gap layer of nonferromagnetic material on the wafer;

etching a third via through the gap layer to expose the top surface of the lower back flux closure;

forming an upper back flux closure of ferromagnetic material in the third via;

forming a second pole piece (P2) on the gap layer, the P2 extending over the P1 pedestal;

forming a second coil on the gap layer substantially confronting the first coil;

depositing insulating material over the second coil; and

forming a third pole piece (P3) of ferromagnetic material in contact with the P2 and the upper back flux closure.

18. The method of claim 17, further comprising the step of depositing alumina prior to the second planarizing step.

19. The method of claim 17, wherein the second planarizing step further comprises the step of removing material until a top surface of the first coil is exposed and planarized.

20. The method of claim 17, further comprising the step of forming a third coil before the step of forming the P3.

21. The method of claim 17 further comprising a third planarizing step which planarizes a top surface of the P2 and a top surface of the upper back flux closure prior to the step of forming the P3.

22. The method of claim 17, the step of forming the P2 further comprising forming the P2 with a narrowest extent over the P1 pedestal and flaring out to a wider extent to form a stitch area.

23. The method of claim 22, wherein the step of forming the P3 further comprises forming the P3 to contact the P2 on the narrowest extent and the wider extent.

24. A method of fabricating a magnetic transducer on a wafer comprising the steps of:

depositing ferromagnetic material to form a first pole piece (P1) on the wafer;

a first planarizing step which removes material from a top surface of the wafer until a top surface of the first pole piece is planarized;

forming a pedestal of ferromagnetic material on the first pole piece;

forming a lower back flux closure of ferromagnetic material on the first pole piece offset from the pedestal;

depositing a first layer of dielectric material on the wafer;

forming a first coil on the layer of dielectric material, the first coil having a plurality of turns of conductive material passing between the pedestal and the lower back flux closure;

depositing a second layer of dielectric material over the wafer to prepare for a second planarization;

a second planarizing step which removes material from a top surface of the wafer at least until a top surface of the pedestal and a top surface of the lower back flux closure are exposed and planarized;

depositing a gap layer on the wafer and in contact with the top surface of the pedestal;

etching a via through the gap layer to expose a top surface of the lower back flux closure;

forming an upper back flux closure of ferromagnetic material in the via;

forming a second pole piece (P2) on the gap layer, the P2 pole piece having a tip portion extending over the pedestal forming a write gap;

forming a second coil on the gap layer, the second coil having a plurality of turns of conductive material passing between the second pole piece (P2) and the upper back flux closure;

depositing insulating material over the second coil; and

forming a third pole piece (P3) of ferromagnetic material in contact with the second pole piece (P2) and the upper back flux closure to complete the yoke.

25. The method of claim 24, wherein the pedestal is formed with a back surface facing the first coil which is substantially perpendicular to the planarized surface of the first pole piece, the back surface defining a zero throat height.

26. The method of claim 24, wherein the step of depositing the second layer of dielectric material further comprises the step of vacuum depositing a layer of alumina.

27. The method of claim 24, the second planarizing step further comprising the step of removing material at least until a top surface of the first coil is exposed and planarized.

28. The method of claim 24 further comprising a third planarizing step which planarizes a top surface of the second pole piece (P2) and a top surface of the upper back flux closure prior to the step of forming the third pole piece (P3).

29. The method of claim 24, the step of forming a second pole piece (P2) further comprising forming the second pole piece P2 with a narrowest extent confronting the pedestal and flaring out to a wider extent toward the upper back flux closure.

30. The method of claim 29, wherein the third pole piece (P3) is formed in contact with the narrowest extent and the wider extent of the second pole piece.

31. A method of fabricating a magnetic transducer on a wafer comprising the steps of:

depositing ferromagnetic material to form a first pole piece (P1) on the wafer;

forming a pedestal of ferromagnetic material on the first pole piece;

forming a lower back flux closure of ferromagnetic material on the first pole piece offset from the pedestal;

depositing a layer of dielectric material over the wafer to prepare for a second planarization;

planarizing the wafer and removing material from a top surface of the wafer at least until a top surface of the pedestal and a top surface of the lower back flux closure are exposed and planarized;

depositing a gap layer on the wafer and in contact with the top surface of the pedestal;

etching a via through the gap layer to expose a top surface of the lower back flux closure;

forming an upper back flux closure of ferromagnetic material in the via;

forming a second pole piece (P2) on the gap layer, the P2 pole piece having a tip portion extending over the pedestal forming a write gap;

forming a coil on the gap layer, the coil having a plurality of turns of conductive material passing between the second pole piece (P2) and the upper back flux closure;

depositing insulating material over the coil; and

forming a third pole piece (P3) of ferromagnetic material in contact with the second pole piece (P2) and the upper back flux closure to complete the yoke.

32. The method of claim 31, wherein the pedestal is formed with a back surface substantially perpendicular to a plane of the gap layer, the back surface defining a zero throat height.

33. The method of claim 31, wherein the step of depositing the layer of dielectric material further comprises the step of vacuum depositing a layer of alumina.

34. The method of claim 31, the planarizing step further comprising the step of removing material at least until a top surface of the first coil is exposed and planarized.

35. The method of claim 31 further comprising a planarizing step which planarizes a top surface of the second pole piece (P2) and a top surface of the upper back flux closure prior to the step of forming the third pole piece (P3).

36. The method of claim 31, the step of forming a second pole piece (P2) further comprising forming the second pole piece P2 with a narrowest extent confronting the pedestal and flaring out to a wider extent toward the upper back flux closure.

37. The method of claim 31, wherein the third pole piece (P3) is formed in contact with the narrowest extent and the wider extent of the second pole piece.

38. A disk drive comprising:

a disk having a thin film of ferromagnetic material on a planar surface of the disk;

a spindle rotatably supporting the disk;

an actuator supporting a magnetic transducer having an air bearing surface confronting the planar surface of the disk; and

the magnetic transducer including a write head comprising:

a first pole piece (P1) having a planar surface;

a first coil including a plurality of turns of electrically conducting material substantially surrounded by electrically insulating material which insulates and separates the first coil from the first pole piece;

a pedestal pole piece on the planar surface of the first pole piece adjacent to and outside of the first coil;

a back flux closure structure extending from the first pole piece to form a back of a yoke;

a gap layer disposed on a first planarized surface including a top surface of the pedestal pole piece;

a second pole piece (P2) positioned with a tip area confronting the pedestal pole piece forming a write gap;

a second coil including a plurality of turns of electrically conducting material substantially surrounded by electrically insulating material, the second coil being adjacent to second pole piece (P2) and positioned to confront the first coil; and

a third pole piece (P3) in contact with the back flux closure structure and the second pole piece (P2) and extending over the second coil.

39. The disk drive of claim 38 wherein the second pole piece (P2) has a surface that is part of a second planarized surface in contact with the third pole piece (P3).

40. The disk drive of claim 38 wherein the pedestal pole piece has a width which is substantially wider than a width of the tip of the second pole piece (P2).

41. The disk drive of claim 38 wherein the second pole piece (P2) has a narrowest extent at the write gap and flares out to a widest extent forming a stitch area in contact with the third pole piece (P3).

42. The disk drive of claim 38 wherein the third pole piece (P3) contacts the second pole piece (P2) at the widest extent and the narrowest extent and extends to an air bearing surface of the magnetic transducer.